

6-4 Completing the Square

ex 1 $\sqrt{(x-5)^2} = 4$

$$x-5 = \pm 2$$

$$x = 5 \pm 2$$

$$x = 7$$

$$x = 3$$

$(x-7)(x-3)$

$$\left\{ \begin{array}{l} x^2 - 10x + 25 = 4 \\ x^2 - 10x + 21 = 0 \\ x^2 - 7x - 3x + 21 = 0 \\ x(x-7) - 3(x-7) \\ (x-7)(x-3) = 0 \\ x=7 \text{ or } x=3 \end{array} \right.$$

$\{3, 7\}$

ex 2 $\sqrt{(x-3)^2} = 7$

$$x-3 = \pm \sqrt{7}$$

$$x = 3 \pm \sqrt{7}$$

$$\{3 \pm \sqrt{7}\}$$

ex 3 $\sqrt{(2x-3)^2} = 5$

$$2x-3 = \pm \sqrt{5}$$

$$2x = 3 \pm \sqrt{5}$$

$$x = \frac{3 \pm \sqrt{5}}{2}$$

ex 4 $x^2 - 6x - 3 = 0$

$$x^2 - 6x + 9 = 3 + 9$$

$$\sqrt{(x-3)^2} = \sqrt{12}$$

$$x-3 = \pm 2\sqrt{3}$$

$$x = 3 \pm 2\sqrt{3}$$

Steps

1. Transform equation so constant (c) is alone on right side.
2. If $a \neq 1$, then divide both sides by a.
3. Add the square of one-half b to both sides.
4. Factor left side.
5. Solve.

ex 5

$$x^2 - 5x + 3 = 0$$

$$\left(\frac{5}{2}\right)^2$$

$$x^2 - 5x + \frac{25}{4} = -3 + \frac{25}{4}$$

$$\sqrt{\left(x - \frac{5}{2}\right)^2} = \sqrt{\frac{13}{4}}$$

$$x - \frac{5}{2} = \pm \frac{\sqrt{13}}{2}$$

$$x = \frac{5 \pm \sqrt{13}}{2}$$

ex 6

$$2x^2 + 2x + 5 = 0$$

$$2x^2 + 2x = -5$$

$$x^2 + x + \frac{1}{4} = -\frac{5}{2} + \frac{1}{4}$$

$$\sqrt{\left(x + \frac{1}{2}\right)^2} = \sqrt{-\frac{10}{4}}$$

$$x + \frac{1}{2} = \pm \frac{3i}{2}$$

$$x = \frac{-1 \pm 3i}{2}$$

Do

$$1. 3x^2 + 12x + 1 = 0$$

$$x^2 + 4x + 4 = -\frac{1}{3} + 4$$

$$\sqrt{(x+2)^2} = \sqrt{\frac{11}{3}}$$

$$2. x^2 - x - 1 = 0$$

$$x^2 - x + \frac{1}{4} = 1 - \frac{1}{4}$$

$$\sqrt{\left(x - \frac{1}{2}\right)^2} = \sqrt{\frac{5}{4}}$$

$$x = \frac{1 \pm \sqrt{5}}{2}$$

$$x+2 = \pm \sqrt{\frac{11}{3}}$$

$$x = -2 \pm \sqrt{\frac{11}{3}}$$

$$x = -2 \pm \frac{\sqrt{33}}{3}$$

HW
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